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Ontario Ministry of the Environment  
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COUNTDOWN ACID RAIN  
GOVERNMENT REVIEW OF THE NINTH PROGRESS REPORTS  
(JULY 31, 1990)  
BY ONTARIO'S FOUR MAJOR SOURCES  
OF SULPHUR DIOXIDE



## INTRODUCTION

Four major corporate sources produce over 80% of Ontario's SO<sub>2</sub> emissions. Each source is required to report every six months on the progress made to reduce SO<sub>2</sub> emissions as required by Ontario's Countdown Acid Rain regulations.

The Countdown program was formulated in 1985 and placed an annual SO<sub>2</sub> emissions cap of 885 kt on the province, to be in place by 1994. Specific reductions in SO<sub>2</sub> began in 1986 and culminate in a cap totalling 665 kt for the four major sources by 1994. In the case of Ontario Hydro, limits were also placed on the total of SO<sub>2</sub> plus nitric oxide (NO) emissions and an interim cut of 35% was imposed effective 1990. The Countdown limits are in addition to standards imposed to ensure good ambient air quality. Annual legal limits are summarized in Table 1.

Table 1  
Sulphur Dioxide Legal Limits  
(thousands of tonnes per year)

|                                                          | <u>1985</u> | <u>1986</u> | <u>1994</u> |
|----------------------------------------------------------|-------------|-------------|-------------|
| Inco nickel/copper smelter, Sudbury                      | 728         | 685         | 265         |
| Falconbridge nickel/copper smelter, Sudbury              | 154         | 154         | 100         |
| Algoma iron ore sintering plant, Wawa                    | 285         | 180         | 125         |
| Ontario Hydro fossil fuel power plants,<br>province-wide | 390         | 370         | 175         |

Each of the four sources has met the legal limits to date and each has submitted detailed plans for implementing its reduction program, as required by the regulations. The sixth set of company progress reports, received in December 1988 and January 1989, set out the detailed methods and schedules for meeting the emission limits of the Countdown regulations. They were accepted by the government.

Implementation progress reports are still required every six months. This document summarizes the contents of the ninth set of semi-annual company reports and the government response. Previous semi-annual reports are available from the Communications Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario, M4V 1P5, (416) 323-4321.

## COMPANY REPORTS AND GOVERNMENT RESPONSES

The progress reports were reviewed by a technical work group drawn from the Ontario Ministries of Environment, Northern Development and Mines (for the metallurgical companies) and Energy (for Ontario Hydro).

The implementation phase of the Countdown program is now well under way, and each of the four regulated companies reports its progress and current status in relation to the 1994 emission limits. A summary of the individual reports, and the Ontario government's response follows.

#### INCO LIMITED

Regulation 660/85 requires a reduction in SO<sub>2</sub> emissions from Inco's nickel/copper smelter complex in Sudbury to no more than 265 kt for any year after 1993, compared to the current limit of 685 kt per year. The company was also required to examine the feasibility of going beyond the fixed limit of 265 kt by 1994 to a level of 175 kt at some future date. Consequently, the feasibility of continuing technical advances remain a concern of Inco and the government. The government previously accepted Inco's position that a specific interim reduction was not feasible because of the nature of the major process changes being undertaken in order to meet the 1994 emission limit.

The company's Ninth Progress Report indicates that:

- Implementation of Sulphur Dioxide Abatement Project is essentially on schedule at present. However, labour disruptions of this summer has severely impacted the overall construction schedules both for the Mill Rationalization and the Smelter SO<sub>2</sub> Abatement Program. Inco's letter to the Ministry subsequent to this report indicates that to keep the program on original schedule an additional cost of \$11.5 million would be incurred.
- Financial commitments of \$320 million have been made. This is approximately 65% of the total estimated project cost.
- Expenditures to-date totals some \$130 million.
- Engineering for the Milling Rationalization project is essentially complete and that for Smelter SO<sub>2</sub> Abatement Program is 60%.
- In May 1990 some 370 engineering and construction management personnel were working on the project. Due to above referred to labour problems, only 280 trades personnel were engaged in on-site contract work instead of the planned work force of 650.

- No scope changes were needed for the Mill Rationalization project and some simplification to the original scope of the Smelter SO<sub>2</sub> Abatement Program has resulted from the development work done by the company.
- Conditional Certificates of Approval (C of A) were given for the Mills Rationalization and Smelter Abatement Programs in December 1989 by the Ministry.

Details on ongoing smelter development programs related to Sulphur Dioxide Abatement Project were provided in the main body of the Inco's 9th semi-annual report.

The government review team concluded that Inco continues to meet the requirements of Regulation 660/85. The company is reminded that the Certificates of Approval referred to in the company's report were issued on the condition that Inco will provide all the necessary operation details and final drawings to the Ministry when a particular section of the process is commissioned. The government also acknowledges the receipt of Inco's new acid plant application for Certificate of Approval which is presently under review. Inco's 1989 SO<sub>2</sub> emissions were 637 kt. Some of the points of concern noted by the reviewers are listed below:

- Inco's letter of July 19, 1990 to the Minister of the Environment indicated that labour problems have been settled and the company is catching up with earlier implementation dates of this program by scheduling overtime. The Ministry appreciates Inco's efforts in meeting schedule dates but also would like an update on revised completion dates for various sub-projects in the Smelter SO<sub>2</sub> Abatement Program.
- The Ministry would like Inco to provide in each semi-annual progress report, noting any changes:
  - (i) a general flow-sheet for the operations in the Sudbury basin covering mineral separation, smelting and refining areas, and
  - (ii) a simplified sulphur balance based on major processes and operations.
- The Countdown Technical Support Group members visited Inco's facilities on November 26, 1990 to clarify some of their concerns. The meeting was found to be worthwhile. Such meetings should be held on a periodic basis to review the implementation of Inco's SO<sub>2</sub> abatement program.

### Mill Rationalization

- Inco should also reconfirm the estimated contribution of the Mill Rationalization project to the overall SO<sub>2</sub> abatement program when the project is fully commissioned in 1991.

### Smelter

- The Ministry needs details on trace metal emissions and effluent disposal methods of the new flash-furnace off gas cleaning system and how effectively the gases will be handled.
- Since copper converter operations will use nitrogen, Inco should provide complete information to the Ministry on the expected emission rate of other contaminants (e.g. NO, NO<sub>2</sub>, etc.) as part of the C of A requirements.
- The Technical Support Group would like an update on R and D work to be included in future semi-annual reports in the areas listed below:
  - (i) Fluid-bed roaster (FBR) off gas cleaning and capture, and
  - (ii) Continuous converting of flash furnace matte.

### Fugitive Emissions

- The Ministry would like Inco to provide pertinent data on the use of the newly proposed 450' stack to handle flash-furnace and MK converter fugitive SO<sub>2</sub> emissions in order to verify the dispersion characteristics of this new point source.
- The Ministry also needs information on all other fugitive sources and their estimated contribution to overall SO<sub>2</sub> emissions. Inco's earlier semi-annual progress reports indicated that changes to smelting operations could reduce fugitive SO<sub>2</sub> emissions by about 70 per cent.

### Acid Plant

- A separate stack for the new acid plant tail gases indicates some scope changes from earlier plans.

- The Ministry would like to know what type of SO<sub>2</sub> and SO<sub>3</sub> monitors will be used to ensure acid plant efficiency (SO<sub>2</sub> conversion/SO<sub>3</sub> absorption), to determine SO<sub>2</sub> loadings to the atmosphere and to detect upset conditions.
- Inco should also indicate to the Ministry the predicted frequency of use for the acid plant by-pass stack and the best estimate of the predicted incidence duration to evaluate the impact on SO<sub>2</sub> ground level concentration (glc).

#### Other Areas

- Inco should respond to earlier Ministry concerns raised in the 7th and 8th Government Summary and Analysis Reports in the following areas:
  - (i) control of converter off gas flow due to intermittent operations and
  - (ii) Superstack SO<sub>2</sub> emissions dispersion characteristics.

#### FALCONBRIDGE LIMITED

Regulation 661/85 requires Falconbridge to reduce the SO<sub>2</sub> emissions from its Sudbury nickel-copper smelter complex to no more than 100 kt for every year after 1993. The regulation also requires Falconbridge to evaluate the possibility of reducing SO<sub>2</sub> emissions below the 100 kt per year level. Promising areas for further reductions have been identified by the company and Ministry technical staff.

The company's report, covering the period January to June 1990, notes that:

- The Company is confident that it will be able to meet the 100 kt of annual SO<sub>2</sub> emission limit in 1994 at full smelter production capacity by making changes to the smelter to capture more SO<sub>2</sub> from roaster/acid plant system.
- The Strathcona Mill modernization program will also provide opportunities for more efficient pyrrhotite rejection and to further lower SO<sub>2</sub> emissions.
- An estimated expenditure of \$16 million will be incurred until 1990 for capital projects from the total

budgeted costs of \$32 million for the SO<sub>2</sub> abatement program.

- Falconbridge 1989 SO<sub>2</sub> emissions were 68 kt.

The Government review team concluded that the company's 9th Semi-annual progress report met the requirements of the Ontario Regulation 661/85 and the SO<sub>2</sub> abatement program implementation is progressing as per schedule. The committee is pleased to know that Falconbridge has successfully achieved 65% sulphur removal of the concentrate in the fluid-bed roasters. Some of the points of concern noted by the reviewers are listed below:

- (a) The Ministry would like the company to include in future semi-annual progress reports:
  - (i) a general flow-sheet covering all operations and
  - (ii) a simplified sulphur balance based on major operations with changes noted.
- (b) The company should indicate an estimate of benefits resulting from the Strathcona Mill modernization program to overall SO<sub>2</sub> abatement program.
- (c) The Technical Support Group also wants to point out to the company that exceedences of certain pollutants could result from the increased dust loading to the environment from elimination of secondary cyclones during acid plant by-pass of roaster gases. Therefore, the company should provide estimated emission rate of these contaminants during acid plant by-pass to the Ministry before the final C of A is issued.
- (d) The Technical Support Group has noted that at present the company's single contact acid plant (A.P.) is not equipped with a SO<sub>2</sub> monitor for A.P. tail gases and recommends a continuous monitor for SO<sub>2</sub> to ensure that the acid plant is operating at high efficiency and to detect any upset conditions related to SO<sub>2</sub> conversion and leaks.
- (e) The Ministry also acknowledges that the September 13, 1990 meeting between the Countdown Technical Support Group members and the company staff was very helpful to resolve some of the Ministry's past concerns and such meetings should be continued on a periodic basis till the SO<sub>2</sub> abatement program is fully implemented.

### ALGOMA SINTER PLANT, WAWA

The Algoma Steel Corporation operates an iron ore sinter plant at Wawa, about 270 km northwest of Sault Ste. Marie. Regulation 663/85 limits current SO<sub>2</sub> emissions from the operation to 180 kt per year, dropping to no more than 125 kt per year for every year after 1993.

In August 1986, the sinter production capacity at Wawa was down-sized by about half. When combined with a change to lower sulphur level in feed, this has resulted in much reduced SO<sub>2</sub> emissions.

The company confirms that it will meet the 1994 SO<sub>2</sub> emission limit by the reduction of the sinter capacity.

The technical review group concluded that the company continues to have met the requirements of Regulation 663/85, and noted that 1989 emissions at 71 kt were substantially below the 1994 limit of 125 kt. As per earlier progress reports, future emissions are expected to be at about 80 kt level.

The reviewers noted that the company did not provide SO<sub>2</sub> emission data for the first six months of 1990 as requested in the Ministry's letter of April 20, 1990 to the company.

### ONTARIO HYDRO

Regulation 281/87 requires Ontario Hydro to meet interim 1990 emission limits as well as imposing a tighter limit for 1994 and beyond. Separate limits are imposed for SO<sub>2</sub> alone and for the sum of SO<sub>2</sub> plus NO (nitric oxide), as shown in Table 2.

Table 2

| <u>Period</u>   | <u>Regulated Limits</u> |                            |
|-----------------|-------------------------|----------------------------|
|                 | <u>SO<sub>2</sub></u>   | <u>SO<sub>2</sub> + NO</u> |
|                 | (kilotonnes per year)   |                            |
| 1986 to 1989    | 370                     | 430                        |
| 1990 to 1993    | 240                     | 280                        |
| 1994 and future | 175                     | 215                        |

The corporation reports that preliminary figures for the first six months of 1990 indicate SO<sub>2</sub> emissions of 134 kt, and NO emissions of 30 kt.

The corporation reports expenditures during the first half of 1990 of \$204 million on measures contributing to the reduction of acid gas emissions, which included:

- \$7.6M for flue gas desulphurization for Lambton Thermal Generating Station (acquisition phase).
- \$27.7M for flue gas conditioning at Lambton and Nanticoke, required to allow the burning of low sulphur coal.
- \$0.7M for research and development.
- \$84.0M for premium for low sulphur coal, which was partially for acid gas control.
- \$84.0M for control actions including electricity purchases, increasing the lignite burn at Atikokan and Thunder Bay TGS and reduced electricity export sales.

The corporation also reported that the bids for supply and installation of the first pair of SO<sub>2</sub> scrubbers at Lambton TGS have been received and are currently under review.

The ninth semi-annual progress report indicates that the flue gas conditioning equipment with SO<sub>2</sub> conditioning agent for all 4 units at Lambton, all 8 units at Nanticoke, and Nos. 5 and 6 units at Lakeview thermal generating stations would be completed and in service during summer 1990. Ammonia injection, planned for fall of 1990, should further improve electro-static precipitator (ESP) operation. The schedule also indicates that the remaining units at Lakeview G.S. will be equipped with flue gas conditioning between 1991 to 1994.

The report also indicates that Ontario Hydro imported an increased amount of electricity from U.S. utilities to meet increased electricity demand and to ensure that the provincial acid gas emission limits are not exceeded in 1990.

Ontario Hydro anticipates that other planned measures, including the use of lower sulphur coals, scheduled start-up of new nuclear units at Darlington and planned flue gas desulphurization (FGD) units, should reduce the requirement for power purchases from sources outside Ontario in future.

The government reviewers concluded that Ontario Hydro has been meeting the requirements of Regulation 281/87. Some other points noted by the reviewers are listed below:

- Government reviewers note that an additional reduction of  $\approx 24\%$  in  $\text{SO}_2 + \text{NO}$  emissions from actual 1989 level is needed to meet 1990 acid gas emissions limit.
- As indicated in the Government review of the 8th Countdown company report (January, 1990), Hydro's  $\text{NO}_x$  ( $\text{NO}$ ) emissions are still of some concern to the government due to upcoming discussions on Federal/Provincial  $\text{NO}_x/\text{VOCs}$  Management Plan requirements and UN ECE protocols of 1988 to which Canada is a signatory. The Ministry expects Hydro to provide more details in this area in future progress reports.
- Hydro's purchases of electricity from U.S. power plants to comply with acid gas emissions limit of 280 kt for 1990 is also of some concern. Hydro's U.S. electricity purchases for the first 6 months of 1990 amounted to 12% of the total power generation in Ontario.





